STATE & PRIVATE FORESTRY
FOREST HEALTH PROTECTION
SOUTH SIERRA SHARED SERVICE AREA

Report No. SS11-04 **File No. 3420**
January 21, 2011

To: **Tina Terrell, Sequoia National Forest, Forest Supervisor**
Steve Hanna, Sequoia National Forest, Forest Silviculturist
Priscilla Summers, Western Divide Ranger District, District Ranger

Re: **Western Divide Ranger District Residential Tracts**

Summary

When Forest Health Protection pathologist and entomologist make site visits the discoveries generally fall into one of two classes: either the damage agent is native at just above background levels; or the damage agent is unidentifiable. Landscapes around private residences or administrative sites are typically highly managed sites that do not usually conform to the normal disturbances of the general forest. Mortality or injury is most often undetermined due to numerous abiotic effects not easily recognized. The cause of the declining incense cedars at Soda Springs housing site falls into the second class of unknowns. Other observed damage agents fall into the first category – native and currently not serious threats to forest health. The one exception was white pine blister rust found on sugar pines, which being an exotic will eventually have a major impact upon the forest composition of the SQF. In terms of the overall health of the housing tracts visited, we saw many agents of interest but nothing of special concern.

On the 21st and 22nd of October, in the company of George Powell (Ecosystem Supervisor), Tim Seeley (Recreation Specialist), and Steve Hanna (Forest Silviculturist); Martin MacKenzie (FHP pathologist) made site visits to three different housing tracts and one private residence on the Western Divide Ranger District, Sequoia National Forest (SQF).

I. Declining Incense Cedars at Soda Springs

Despite our combined effort and thorough ground survey, no cause was identified for incense cedar decline at this site. Individual tree conditions were variable as incense cedars less than

100 yards away appeared healthy. The site will be revisited and monitored to eventually discover the cause or document tree conditions.

II. Armillaria fruiting. . (McIntyre Tract)

On the trails between summer homes, a species of mushroom was photographed fruiting on an exposed dead and decaying root other mushrooms were observed on several small stumps (< 6 inches). It was our opinion that the root had belonged to a white fir and the mushroom an *Armillaria* species. Characteristics of the fungus did not fit the classic image of *Armillaria mellea*. For this reason, specimens were collected and cultured, in the in the Sonora lab, to determine whether the mushroom in question was indeed an *Armillaria* species. Forest pathologists generally consider *Armillaria mellea* to be the only pathogen of conifers in California (Wood *et al*, 2003). However, a detailed study by Baumgartner and Rizzo (2001) identified four species of *Armillaria* from California: *A. mellea, A. gallica, A. nabsnona,* and North American Biological Species X (NABS X)

> NABS X is the tenth and as yet unnamed species of *Armillaria* known from North America. As isolates of this species will not mate with any other known species we consider them to be biologically isolated from the other species. Until isolates of this biological species are induced to fruit in culture and a taxonomist formally describes it the fungus does not have a formal name.

As *Armillaria nabsnona* is only found in the coastal regions, and NABS X has only been recorded in Northern California (Baumgartner and Rizzo, 2001), these two species could be eliminated from consideration. This leaves only *A. mellea* and *A. gallica*. However, *A. gallica* has never been recorded killing conifers in California, therefore this *must* have been *A. mellea*. The error in this deduction lies in the fact that no evidence of Armillaria-associated mortality in the housing tracts was detected. Rather, this supports the concept of an *Armillaria* species that acts as a saprophyte of stumps (i.e. the fungus was recycling dead wood).

A

B

A & B. Some of the morphological characteristics that suggest an *Armillaria* species. F**igure A:** white spore deposits can be seen (Note: all *Armillaria* species have white colored spores). **Figure B**: the bulbous base and annulus (red arrows) (Note: most *Armillaria* species have both characteristics, but a few species lack one or the other). While the honey colored cap and pattern of gill arrangement in theses specimens can be found in many other species, these characteristics are consistent with *Armillaria* species.

C

Figure C. After confirming the fungus spore print was white, sub cultures were grown and here three 1/4 inch plugs of the spore isolate are seen growing on a 3% Malt Agar Petri dish. The bootlace like rhizomorphs, so typical of an *Armillaria* species, can be seen growing over and through the agar. This evidence confirms an *Armillaria* species.

The presence of *Armillaria* was confirmed among the houses in the tracts. At the time however, there was no evidence of any Armillaria root diseases problem developing. FHP will continue to monitor this site during future site visits.

III Hazard Trees. (McIntyre Tract)

While walking the McIntyre tract, no obvious hazard trees were observed. One snag on an undeveloped lot was observed and it is suggested it could be felled as a courtesy to the owners to prevent any unlikely accidents. Some white fir trees were exhibiting injury from dwarf mistletoe infections and may need to be thinned out if posing a hazard to homeowners. At this point in time, the forest has a well managed hazard tree mitigation program for these tracts that has significantly reduced all current risk. This is not to say that there is no risk, it is to say that the risk to cabins and their owners is well managed in these tracts.

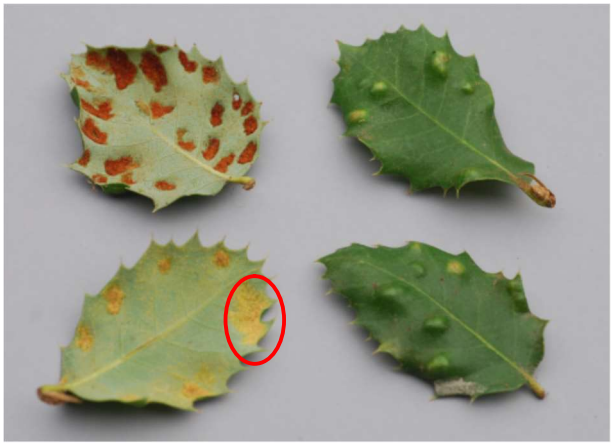
IV. Live Oak Erineum mite. (McIntyre Tract)

Class; Aracnida

Order; Acari

Family; Eriophyidae
Genus & Species ***Eriophyes mackiei***

While walking amongst the cabins, a small canyon live oak with blisters leave was noticed. The stem was growing through a crack in a deck from a seedling or sprout from a stump beneath the relatively new deck. Suspecting that blisters might have a fungal origin, specimens were taken back to the Sonora lab for microscopic examination.

D  E

D & E. Images of the upper and lower surfaces of the canyon live oaks leaves, with the region circled in D, enlarged as image E. The eriphyid mite induced hairs (of leaf origin) are visible in E, but the microscopic mites can not be seen at this magnification (see image F).

High magnification revealed tiny carrot shaped mites with annular constrictions on their body and all their legs at one end. Their secretions or irritations of the lower epidermal cells of the leaf had induced it to produce a dense mat of hairs and the surface to blister upwards. It was within these mats of hairs that the mites were found (see below).

F G

F Microscopic view of a mite (circled) amongst the mass of mite induced leaf hairs. G. A similar infection of coast live oak (Photograph, with permission of Judy McBride).

Regardless of the damage impact, even minor issues can be significant and should be considered in perspective. For many forest pests, the combination or progression of effects typically lead to larger issues that do not appear significant at the moment. Project or personal objectives then will influence future management decisions – all with their own subsequent effects. A prime example is white pine blister rust

V. White pine blister rust. (Slate Mountain tract)

Just off the deck of a cabin was a small sugar pine with a severe white pine blister rust canker on the main stem. This will be a serious loss to the cabin owner. Looking into the canopy of a few maturing sugar pines nearby, the occasional branch flagging would indicate that the overstory trees were also infected but not dying from the rust. The flagging does not constitute a hazard problem, but should be noted as an infected tree.

Sugar pines in the southern Sierras are declining at a rapid rate due to several factors, primarily blister rust. Genetic studies in throughout the Sequoia National Forest have determined several mutations of blister rust – some highly aggressive. Ocular examination cannot assess which strain is which, but planting of current resistant stock developed by the Forest Service nursery is still highly encouraged. Short term endurance of infected pines may be prolonged if proper care is provided until maturity.

VI. Animal Damage. (Slate Mountain tract)

Forest health is not just about fungal and insect damages; it also includes abiotic and animal damages. Most often it is not possible separate the insects from the fungi they facilitate or the abiotic agents (drought and or fire) that trigger the changes.

H

H. A garlic oil dispensing unit produced by Plant Protect® to deter both rabbits and deer

A device near one cabin was utilized to prevent deer browse of some plant. David Bakke (Regional pesticide specialist, *personal communication*) determined the device was designed to repel deer and rabbits by their garlic oil aversion. Judging by the browsed and defoliated plant, the treatment did not work. If objectives for this tract are to encourage specific understory regeneration, then other protective barriers will need to be considered. It is not recommended to plant non-native species; even if not preferred by local wildlife.

VII. Imidacloprid treatments against bark beetles. (Camp Nelson)

We had been invited to evaluate a Ponderosa pine at 1230 Wy Court in Camp Nelson. The homeowner was not available, so no destructive sampling of the requested tree was done. The tree was already declining at the time of our visit (Figure I). Upon closer examination, the base of the tree was encircled with imidacloprid capsules (figures J & K). We observed a lack of resin response by the tree, to either the injection sites or bark beetle entries. A few bark beetle pitch tubes were found with some that may have been from the year before. The lack of resin flow from drill holes made to insert the capsules indicates that the tree was moribund *before* treatment.

I

J

I The bark beetle killed tree in question & J the spiral of imidacloprid capsules at the base of the tree.

K

K. A close up of the capsule indentifying the active ingredient

Imidacloprid is the first of a new class of insecticides, the neonicitinoids. It is a chlorinated analog of nicotine that inhibits the activity of acetylcholinesterase at the nicotinic acetylcholine receptor sites at insect nerve junctions. This insecticide blocks insect nervous systems at junctions between nerve cells, preventing signal transmission. Imidacloprid is a water soluble insecticide that moves upward in the tree xylem to eventually reach the needles or leaves. Upon contact, imidacloprid paralyzes insects as it shuts down nervous transmission. By drilling through the phloem layer and injecting the insecticide into the xylem the homeowner bypassed the target insect. However based on the low resin exudation the tree appears to have been declining *prior* to beetle attack and probably would have died regardless. Unfortunately the mode of spread within the tree precluded it reaching the insects. If the imidacloprid could have reached the bark beetles it would have killed them. Being systemic the insecticide will eventually reach the needles or leaves of a tree and thus be delivered to any aphid, scale, or leaf mining insect that has its mouthparts in the vascular system of the tree. Upon contacting the imidacloprid laden water the mouth parts of the insect become paralyzed as the insecticide shuts down nervous transmission.

Imidacloprid-based insecticides are relatively safe in the environment since nervous systems of mammals do not have nicotinic acetylcholine receptor sites. It only kills insects, earthworms, and a few species of fish. It is the active ingredient in Advantage™, the topical insecticide applied to dogs to kill fleas. The dog absorbs the insecticide through its skin, the insecticide is distributed in the dog's blood and when the flea bites the dog it gets a mouthful of imidacloprid laced blood; its mouth parts become paralyzed and the flea dies in minutes.

Alternatives to protecting high value trees. Creating healthy stand conditions is the best management to preventing bark beetle attack. Healthy trees have adequate defense mechanisms against pests and are more resistant and resilient during times of drought. Homeowners in rural areas should view their surrounding trees like those in the general forest: providing open space for growth, reducing mechanical damage to stem and roots, and water sparingly.

The most effective individual tree protection against bark beetles is with carbaryl-based insecticides that are applied to the outside of the tree bole. This insecticide is often recommended for campgrounds, administrative, or special sites. A good general public leaflet on carbaryl is available at:
http://www.fs.fed.us/r1-r4/spf/fhp/publications/byregion/carbaryl_insecticide_2.pdf

Scientific support by Fettig *et al* (2006) on carbaryl is listed in the references. Two main points made in the leaflet are:

(1) No registered insecticides are available that successfully prevent tree mortality once it has been infested. Carbaryl is a prevention treatment; it will not eradicate beetles already within the tree.

(2) Contractors applying insecticides must be licensed and insured in California.

Forest Health Protection supports proactive management that seek to retain stand integrity while improving overall stand resiliency and resistance against potential insect/disease infestation or other disturbance agents. Homeowners are strongly encouraged to work closely with district personnel if they have any questions or concerns regarding future projects around their homes. Proposed management activities will also benefit other project objectives such as fuel reduction/wildfire prevention. The strategies outlined by the district for forest health improvement are concurrent with FHP prevention objectives and desired outcomes. If you have any concerns or require further information regarding this report, please do not hesitate to contact us.

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